REMARKS

Claim status

Applicants amended claim 1, 27, 36, 41, 57, 59; and added claims 61-64. Support for the amendments to claim 36 can be found at page 7, lines 5-6. Support for the amendment to claims 1, 41, 57, and 61-64 can be found, for example, in FIG. 2. Claims 1-20, 22-25, 27-34, 36-39, 41-50, and 52-64 are presented for examination.

As amended, claims 1, 41, 57, and 61 cover methods of making electrodes (e.g., cathodes) for batteries including pulling an expanded metal grid including aluminum. The metal grid has an initial tensile strength and an array of diamond-shaped openings. Each opening has a long dimension and a short dimension, and each opening is defined by four elongated boundary elements. Each boundary element has a length. The pulling is along a direction other than the length of any of the elements and increases the short dimension of the openings and increasing the tensile strength to greater than 5 lb/in.

Support for the amendment can be found in FIG. 2:

FIG. 2

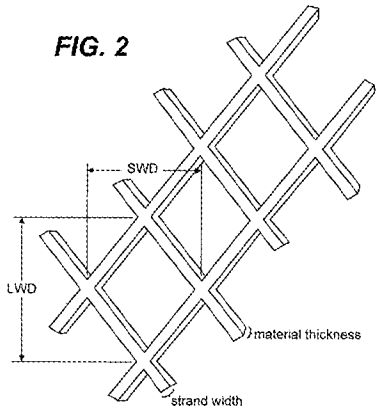

FIG. 2

As can be seen from FIG. 2, each opening has a long dimension (LWD) and a short dimension (SWD). The boundary of each diamond shaped opening is defined by four elongated elements. During pulling, the direction of pulling is not along the boundary elements, i.e., the direction is not parallel to any of the boundary elements. Instead, the pulling increases the short dimension

(SWD) of the openings. A possible pulling direction is added below the reproduced figure for illustrative purposes.

Claims 62-64 cover methods of making a cathode for a primary lithium battery including pulling an expanded metal grid including aluminum. The expanded metal grid has an initial tensile strength and an array of diamond-shaped openings, each opening having four angles, the pulling changing at least one of the angles and increasing the tensile strength to greater than 5 lb/in. The methods further include applying, to the expanded metal grid, a composition including a cathode active material. Referring again to FIG. 2, each diamond shaped opening is defined by four angles, two of which are along the short dimension, while two remaining angles are along the long dimension. During pulling, the short dimension (SWD) is increased, and at least one of angles changes. Consequently, pulling is not along the length of any of the boundaries.

35 U.S.C. § 112

The Examiner rejected claim 36 for allegedly being indefinite. Applicants amended claim 36 to obviate this rejection, so this rejection should be withdrawn.

35 U.S.C. § 103

The Examiner rejected claims 1-20, 22-25, 27-34, 36-39, 41-50, and 52-60 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5, 543,249 ("Takeuchi") in combination with U.S. Application Pub. No. 5,543,249 ("Michel"), and further in combination with "Candidate material for the sulfur electrode current collector", Corrosion Science, Vol. 26, No. 5, pages 377-388, 1986" ("Tischer"); or further in combination with U.S. Patent No. 6,447,957 ("Sakamoto").

Claims 1, 41, 57, and 59 are the independent claims and were discussed above. As a preliminary matter, the Examiner has incorrectly maintained the position that when a current collector is stretched (e.g., pulled), it is also leveled. Applicants explained the difference between stretching (or pulling) and leveling in the response to the January 8, 2007 Office Action. Specifically, leveling occurs by passing the grid between rollers to reduce the thickness of the grid, flatten it, and increase its temper by strain hardening. In contrast, pulling includes altering

the grid dimensions, such as the short dimension, which can alter the current path through the grid and the resistivity in the machine direction and/or the cross direction. (See, e.g., application, page 7, lines 8-10). Further, as shown in Table 3 of the application, the grid thickness of a leveled grid at 14.7 mils compared to that of a pulled grid at 18.4 mils is clearly different. Therefore, pulling and leveling refer to different processes, and a current collector that is pulled or stretched is not simultaneously leveled. The Examiner has not provided a technical rationale regarding why in his view a current collector that is stretched is also leveled, when stretching does not require passing between rollers while leveling requires passing between rollers. Applicants respectfully request that the Examiner either allow dependent claims 22 and 36, or provide reasons for maintaining his position with regards to the term "leveling".

Turning to the 35 U.S.C. § 103(a) rejection, Takeuchi does not disclose or suggest the subject matter covered by claims 1-20, 22-25, 27-34, 36-39, 41-50, and 52-60. Instead, Takeuchi discloses an expanded metal grid formed of titanium or aluminum, but does not disclose either pulling or leveling an expanded metal grid including aluminum and an array of diamond-shaped openings.

Michel also does not disclose or suggest pulling a grid having an array of diamond-shaped openings to increase the short dimension of the openings and increase the tensile strength to greater than 5lb/in, nor does he disclose leveling a current collector prior to coating by passing the current collector through rollers. Instead, Michel discloses forming his current collector by stretch-forming following perforation. (See, e.g., Michel, [0024].) The current collector is clamped into a stretch-forming press, which includes tongs and a stretching table, and the stretched current collector is obtained by pulling apart the tongs. (See, e.g., Michel, [0036]). In contrast to claims 1-20, 22-25, 27-34, 36-39, 41-50, and 52-60, where the expanded metal grid is pulled to increase the *short dimension* of the openings and thereby increase the tensile strength of the grid, Michel is silent with respect to the pulling direction and the tensile strength of his current collector. Further, the claims require that the pulling is along a direction *other* than along the length of any of the boundary elements. To the extent that Michel's current collector current can be construed to have directionality, the current collector is pulled *along* the boundary elements to form continuous holes, as seen by the arrows in FIG. 2, reproduced below. (See, e.g., Michel, [0024], [0036], and FIG. 2).

FIG 2

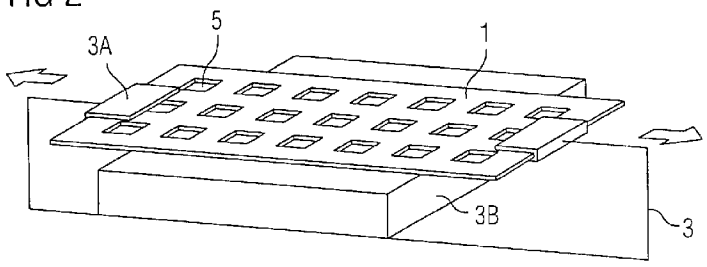

FIG. 2, Michel.

Further, a person of ordinary skill in the art would not have been motivated to pull a grid current collector to increase its tensile strength upon reading Michel as Michel is concerned with forming holes, nor would there be any expectation that the tensile strength would be increased if a person were somehow motivated to pull a grid current collector. In contrast to Michel, Applicants have demonstrated that by pulling to increase the short dimension ("SWD"), the tensile strength unexpectedly increases compared to that of a current collector that has not been pulled. (See, e.g., application, page 10, Table 2). For example, in Table 2 of the application, the nominal grid long dimension ("LWD") remained unchanged for the pulled and the untreated grids, but the tensile strength increased from 3.3 lb/in to 5.8 lb/in or 8.68 lb/in when the grids were pulled along the short dimension.

The Examiner contends that it would have been obvious to modify Takeuchi's current collector by pulling with the expectation of achieving the benefits of increased surface area and tensile strength (office action, page 4). Applicant respectfully notes that the Examiner has failed to provide any technical explanation for this contention. Applicants respectfully request that the Examiner either withdraw the 35 U.S.C. § 103(a) rejection based on Takeuchi and Michel, or at least provide support for his position that the pulling benefits would be expected so that Applicants can review and address the Examiner's concerns.

Michel also does not disclose leveling the grid before coating by passing the grid between rollers. Thus, even if Michel is combined with Takeuchi, the method covered by dependent claims 22 and 36 is not achieved. The 35 U.S.C. § 103(a) rejection of claims 22 and 36 should be withdrawn for this reason as well.

Tischer does not fill the gaps in Takeuchi and Michel, discussed previously, at least because Tischer does not disclose or suggest either pulling or leveling a grid having an array of

diamond-shaped openings, the pulling being along a direction other than along the length of any of the boundary elements to increase the short dimension of the openings and to increase the tensile strength to greater than 5 lb/in. Instead, Tischer discloses an aluminum-silicon carbide composite for use in sodium-sulfur batteries. (See, e.g., Tischer, page 377, Introduction).

Similarly, Sakamoto does not fill the deficiencies in Takeuchi, Michel, and/or Tischer, at least because Sakamoto does not disclose or suggest either pulling or leveling a current collector to increase the short dimension of the openings and increase the tensile strength to greater than 5 lb/in. Instead, Sakamoto discloses a current collector having etched throughholes for use in secondary batteries.

In sum, none of Takeuchi, Michel, Tischer, or Sakamoto, discloses or suggests the methods covered by claims 1-20, 22-25, 27-34, 36-39, 41-50, and 52-60, and there is no suggestion to combine these references to provide the methods covered by these claims. Further, even if the references were combined, the resulting methods still would not be the subject matter covered by the claims. Therefore, Applicants respectfully request that the § 103(a) rejection of these claims be withdrawn.

Applicants believe the claims are in condition for allowance, which action is respectfully requested.

Please apply the $420.00 excess claim fee and any other charges or credits to deposit account 06-1050, referencing attorney docket no. 08935-291001.

Respectfully submitted,

Date: March 4, 2008

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